



## **Alternate Reality Teaching: OurSpace**

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**Final Report Phase 1**

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## 1. ABSTRACT

Computer games offer the ability to attract and hold children's attention for extended periods of time, often exceeding that of the classroom environment. OurSpace offers an innovative game tailored to pique the interest of first grade students in Science concepts. The environment the game is hosted in allows various levels of education/play with graphics and other concepts to interest students while collecting metrics that may be used by educators to assess the performance of any individual student. The Prototype game is hosted on a server accessible by using a web browser from a computer with internet access.

The rapid development objective of the program to have a functional prototype in 8 months was achieved through cooperation amongst the Intific Team (University of Denver, Texas A&M University and especially Digital Steamworks) as well as extensive collaboration with CRESST/UCLA and DARPA staff. We would like to recognize all for their assistance and contributions.

Intific believes that in the modern digital age it is now possible to fuse this method of self-paced learning with classroom processes and guidance to energize students to achieve greater levels of interest and performance in Science, Technology, Engineering and Mathematics (STEM) topics. The very cumulative nature of computer game progression ties extremely well the educational layering required to teach STEM related material.

Our discoveries in this first phase have shown that this type of training must be configurable or modifiable by the educators in order to adapt the material to the learning levels, capabilities and potentially, the disabilities of the individual students. Feedback through collected data, metrics and eventually analytical tools must assist the educators in rapidly identifying the changes needed for each individual or for the group as a whole. Initial testing indicated that there will be occasions when additional educational levels need to be added in order to effectively convey the concepts.

## 2. WORK ACCOMPLISHED

Guided by the ENGAGE goals of interested young students in Science, Technology, Engineering and Mathematics (STEM) topics through the use of education game playing, Intific and our team has worked with CRESST/UCLA and developed a prototype version of an educational game. The specific Task elements are:

### 2.1. TASK 1: IDENTIFY DESIRED EDUCATIONAL OUTCOMES, STEM FOCUS, DEVELOP GAME CONCEPT(S) AND STORYBOARDS.

Our team, with input from CRESST (UCLA) and DARPA, developed storyboards and a list of learning objectives and other game function requirements for OurSpace. OurSpace is a story about a team of three characters who must journey from their ecologically distressed world to three different planets in an effort to learn skills to repair their home. In the process, they end up helping the residents of each planet. The design provided for differing learning objectives on each world with incremental levels teaching differing STEM concepts in a progressive manner.

Deliverables:

**Storyboard document:** Submitted 2 Nov 2011, and Approved

**Game Design Document:** Submitted 27 Nov 2011 and Approved

## 2.2. TASK 2: BUILD GAME, GAME ARCHITECTURE, & COMPLETE DEVELOPMENT TESTING.

Digital SteamWorks developed a Flash-based prototype of the game, implementing a total of 32 levels spread across the three worlds.

Intific developed the OurSpace web site and with features for capturing and reporting individual performance measures. Typical information captured involves mouse clicks, time measurements and achievements reached. Collectively we integrated this system and began hosting that environment and application on a Web Server in May. CRESST/UCLA has begun some preliminary testing.

Denver University, with support from Intific, developed “OurSpace Adaptation: A White Paper” (included with this report) presenting concepts for analysis in Phase II. Adaptation may encompass many areas, so the team will evaluate these concepts, correlated with the prototype game metrics to determine what types of adaptation could be effectively implemented in subsequent development. The primary areas we are investigating are adjustment of game content for students with sensory disorders, adjustment of game teaching style based on learning styles of individuals, adjustment of game content and pacing through a teacher console, and real-time automatic game content adjustment based on player performance.

Texas A&M University is developing some concepts for further Social/Emotional Learning (SEL) objectives that could be incorporated into Phase 2 efforts. Their analysis is being performed on the Prototype Game. This includes an investigation into how to successfully measure SEL through measures/metrics rather than in person observation and interviews, which is highly beneficial in a game that is widely distributed.

One of the concepts in the DARPA project discussions was Crowd Sourcing. While this concept is still being refined, when coupled with the concepts of Adaptation, it became obvious that a customizable environment needed to be created to support the further objectives. Intific is developing a “Game Creation Framework” which will be used to support the future objective and allow OurSpace to evolve. Intific has successfully transformed 3 key levels of the prototype game into this platform and will further develop the environment and convert the OurSpace game into this framework in order to support the Phase 2 Test Ready Game Objective.

Deliverables:

**Alpha game software:** Submitted 28 Feb 2012

**Beta game software:** Submitted 27 Apr 2012

**Prototype game software:** Submitted with this report

**Source Code:** The source code for the Prototype Flash based program is being sent on a DVD via FedEx. The source code and configuration instructions for the Web Server which is built upon commercial products is not included on this DVD\*.

**Executable:** The executable for the program is hosted upon a web server. Intific has hosted this on a public space which is accessible to DARPA/ONR and other teams. We will continue to host in this space during Phase II so that evolutions are visible to the entire team upon release. The location of this portal is <http://engagedemo.intific.com/>. The user may register at this location and create an account for their use. Once the user has logged in the initial attempt to play the game will require two additional credentials. These credentials will be emailed to DARPA under separate cover.

\*Intific will provide the list of third party products and develop a configuration instruction for the government if required. Since this is a rapidly executing program with the next delivery in Phase 2 scheduled for November, and the Prototype Game is expected to be replaced with a more functional game engine, we have not spent the time preparing the instructions and process for external parties.

### 2.3. TASK 3: PROGRAM MANAGEMENT

Intific has coordinated the efforts of our team with the overall objectives of the program and the periodic DARPA led meetings. The development of the initial game was completed earlier than originally forecast allowing us to focus on the quality of the experience and the depth of the metrics measured.

Deliverables:

**No Physical Deliverables**

### 2.4. TASK 4: MEETINGS, DOCUMENTATION & REPORTING

Team participation in the DARPA meetings has yielded benefits to our development program. Our documentation has been delivered and accepted along with our reports.

Deliverables:

**Slide Presentations:** Submitted 17 Aug 2011

**Monthly Reports:** Submitted as required

**Final Phase Report:** This document

**Implementation Documentation:** Due 1 Month after Phase 1 complete (20 Jun 2012)

**Technical Papers:** Attached.

## 3. OUR STEM TEACHING APPROACH

Computer games offer the ability to attract and hold children's attention for extended periods of time, often exceeding that of the classroom environment. Using the gaming concept of successful completion of a level allows the player to move up the hierarchy in the game, various concepts can be layered during a session in a manner similar to the education progression for STEM topics.



### 3.1. SCIENCE CONTENT TO BE INCLUDED IN PHASE I PROTOTYPE

Based on our collective discussions during the TA-1/TA-2 meeting in Austin, it was agreed upon that the science domain for the game would be Force and Motion, and that the student population to be targeted would be Grade 1. Based on that criterion, CRESST recommended the following science concepts and associated cognitive demands, requisite skills, and learning objectives be taught in the game, and done so in the sequence indicated (see table below).

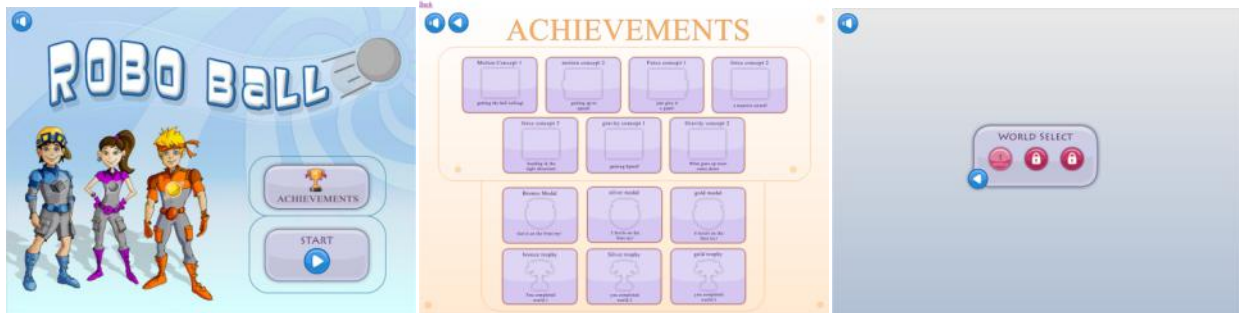
NOTE: The requisite skills represent typical topics of discussion/lessons that students learn along the way to being able to achieve the terminal objectives.

Task	Concept	Cognitive Demand(s)	Requisite skills (Needed to achieve terminal objective)	Terminal objectives
1	Forces	Content Understanding	When presented with a situation or a scenario in which a force is applied (e.g., girl kicking a ball), the student will identify the forces (e.g., foot/kick) acting on the ball that resulted in the change in motion. The students will predict the outcome (i.e., change in speed) as a result of an impetus force applied on an object.	Given a ball (or similar object) at rest, the student will move the object in a constrained direction by applying a force to it.
2	Speed	Problem Identification Content Understanding Cause-effect reasoning	Distance: Students will be able to recognize distances of objects from a source object (e.g., given a picture with three objects, identify the one that was furthest away from the source object). Time: Students will be able to recognize durations of time (e.g., given three separate events, identify the one that took longest to complete). When presented with a situation or a scenario (e.g., the ball rolled to the end of the street in two minutes), the student will describe the speed of an object as the amount of distance over time.	Given a ball (or similar object) in motion, the student will determine its speed (faster, slower, or the same) relative to other moving and non-moving objects. Given a ball (or similar object) in motion in a constrained direction, the student will increase its speed by applying one or more forces in the same direction of motion.
3	Opposing Forces	Problem Identification Content Understanding Cause-effect reasoning	Forces (see task 1) Speed (see task 2)	Given a ball (or similar object) in motion in a constrained direction, the student will determine (and apply) an appropriate force to bring the object to rest or slow down.

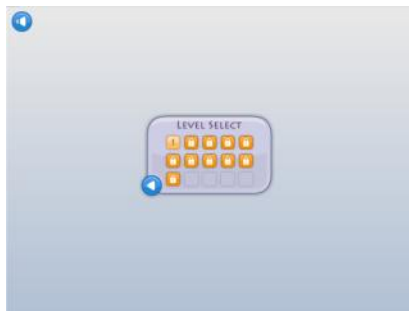
4	Friction	Problem Identification Content Understanding Cause-effect reasoning	Opposing forces (see task 3) Student will contrast surface characteristics of different objects (e.g., texture, smoothness).	Given an object moving along a surface, student will identify the direction of the frictional force acting on the object (i.e., friction opposes motion). Given different surfaces, the student will determine for each its relative coefficient of friction (high, medium, low) compared to other surfaces. Given a ball (or similar object) in motion along a given surface, the student will determine the frictional force opposing the object's motion (high, medium, small) relative to when the object moves along other surfaces.
5	Resultant Forces Gravity	Problem Identification Content Understanding Cause-effect reasoning	Forces (see Task 1)	Given a ball (or similar object) at rest and a force applied in both the x-direction, and the y-direction (simultaneously), the student will predict the path of the object's motion. Given a ball (or similar object) at rest, the student will determine (and apply) one or more forces in the x-direction, and one or more forces in the y-direction (simultaneously) to move the object to a specified location. Given a ball (or similar object) in motion through the air, and under the influence of gravity, the student will predict the path of the object's motion. Given a ball (or similar object) in motion through the air, and under the influence of gravity, the student will determine (and apply) one or more forces in the horizontal direction to move the object to a specified location before falling to the ground.

### 3.2. GAME LEVELS

Based the objectives above, the team created and submitted both Storyboard and Game Design Documents. These documents described a game with thirty-two (32) levels spread across three worlds. The Progression chart is the master list of the levels, which was created by merging the learning progression with the game skill progression in a manner that serves the goals of each. The result is a game that introduces game mechanics in parallel with learning targets. The intro screen is show, on the next page with the Achievements and the world selection. The game allows the reply of any previous level. Once a level has been successfully accomplished, the next level is unlocked. The achievements screen lists the awards and accomplishments the player has earned. Each Hero is associated with the specific object shown on their chest. The elements include a metal ball, a rubber ball and a metal cube.



### 3.3. WORLD 1



This world opens with a story sequence of the polluted air world called Cirrus. The imagery is shown with the SEL concepts in Section 4.2. There are eleven levels in this world focusing primarily the force of gravity and rolling motion. The last level introduces a new force concept. Upon completion of a level, the player can choose to go to the next level (double arrow to the right, or select a specific level with the center button, or replay the level with the left button (redo). The user may select the unlocked levels in the panel at the left, or return to

the prior screen. The following chart is a section of the progression chart. The left two columns display which characters and mechanics are introduced, while the right columns show the learning targets per level.

World / Level	Character (green if intro)	Props	Teaching focus	Instructional Goals /Background Knowledge
1/1	Robo	Platforms	MOTION: Motion is change in position	Students are able to demonstrate that motion is a change in the position of an object. BACKGROUND: <i>Motion of an object is any physical movement or change in position or place.</i>
1/2	Robo		MOTION: Motion is change in position	
1/3	Robo		pushing an object at different locations creates different motion	
1/4	Robo		Force against various masses and at different angles causes different results.	
1/5	Robo		a faster push on an object with a set mass makes it go farther	
1/6	Robo		MOTION: moving object at different speeds causes ball to travel farther and at a higher rate.	Students will be able to distinguish the concepts of position and distance, time and duration, and speed. Students understand that speed is proportional to distance traveled and inversely proportional to travel duration. BACKGROUND: <i>Motion is the act of changing position.</i>
1/7	Robo		MOTION: alt version of prev	
1/8	Bouncer		MOTION: moving at diff speeds causes diff distances of travel	
1/9	Bouncer		MOTION: balls at diff speeds reach destination in diff amounts of time	
1/10	Robo, blockhead as non-player	dynamic physics objects	MOTION: A force causes object to move a specific amount.	
1/11	Bouncer	Boxing Glove	FORCE: different amounts of push cause objects to move more or less	Students can demonstrate that a force is a push or pull that can change an object's position and put it into motion. BACKGROUND: <i>The position and motion of an object can be changed by pushing or pulling. An object at rest will stay at rest unless a force is applied.</i>

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### 3.3.1. WORLD 1 LEVEL 1

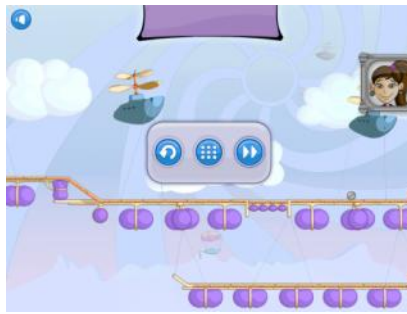


The level opens with an insert to guide the player. This objective was to minimize the audio portions that might be required. The player is given an idea of what to do in the inset. If the player successfully completes the level, they are rewarded with the smiling

character and any achievements as indicated at the bottom of the screen. This involves the female character associated with the steel ball.

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### 3.3.2. WORLD 1 LEVEL 2



This level shows an opening and the rolling ball. The user must move the bridge component into the correct location so the ball will roll across successfully.

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### 3.3.3. WORLD 1 LEVEL 3



This level shows the positioning of the components from the purple section at the top. This is where the potential parts for the player to use are stored. The spinning star (below the ball ) shows one of the locations for the bridge element. The other location is the correct location of the bridge element (just below the ball).

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### 3.3.4. WORLD 1 LEVEL 4



This level allowed the player to select and place the correct component to complete the path over the chasm

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#### 3.3.5. WORLD 1 LEVEL 5



This level introduces the concept of multiple forces working on the ball. The spinner provides sufficient force to launch the ball up to hit the goal and then fall into the bottom section in order to roll over to contact the spinning rainbow.

---

#### 3.3.6. WORLD 1 LEVEL 6



This level along with the next demonstrates the varying levels of force imparted by gravity. The sharper ramp accelerates the ball to clear the gap and reach the target.

---

#### 3.3.7. WORLD 1 LEVEL 7



This level shows the lower profile ramp launching the ball into the gap and falling to the lower level in order to reach the target.

---

#### 3.3.8. WORLD 1 LEVEL 8



Level 8 introduces the rubber ball associated with the blond headed male. The inset demonstrates a bouncing ball. This is a complex level requiring multiple parts be placed correctly and some understanding of the new rubber ball properties. The yellow (rubber) ball is associated with the blond male hero.



### 3.3.9. WORLD 1 LEVEL 9



Level 9 introduces the concept of controlling 2 different objects in motion and the relative forces acting on them. The first ball to hit the lever at the bottom gets through and the second is blocked. Prioritization is a new concept.

### 3.3.10. WORLD 1 LEVEL 10



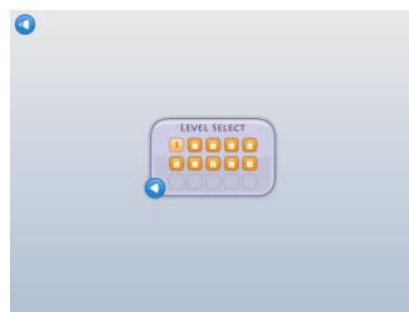
Level 10 introduces the concept of a collision and the force imparted to the second object. The player must place the cube in the correct location so that the ball will force it over the edge reaching the target. The cube is associated with the brown male hero.

### 3.3.11. WORLD 1 LEVEL 11



Level 11 is the final level in this world. It introduces the concept of and external force providing an impulse. The cube must be knocked over to the conveyer belts so it can make its way down to the target. This is the first level where the player must make a determination regarding the proper amount of force that will be required.

## 3.4. WORLD 2



This world opens with a story sequence of the polluted water world called Hydron IV. The imagery is shown with the SEL concepts in Section 4.2 There are ten levels in this world building on the previous concepts and adding other variations of force and trajectory. Again, the user has the ability to select the next level or any unlocked level. The following matrix ties the Teaching focus / Instructional goals to the game level.

World / Level	Character (green if intro)	Props	Teaching focus	Instructional Goals /Background Knowledge
2/1	Robo		FORCE: pushing at different angles causes different motion	Students will demonstrate understanding that the more massive an object, the more force is needed to set the object into motion in the direction of the force. <i>Mass is the amount of matter in an object. Mass is not the</i>
2/2	Bouncer			
2/3	Robo	Mallets	FORCE: diff mass requires diff amount of force	
2/4	Blockhead		FORCE: same force and diff mass goes diff distance	
2/5	Robo		FORCE: More dense object of similar size requires more force to move.	
2/6	Blockhead	Cart	FORCE: momentum	
2/7	Blockhead		FORCE: compare diff densities	
2/8	Bouncer		FORCE: Pushing at various angles causes various trajectories.	Students are able to explain that forces are composed of magnitude and direction. BACKGROUND: <i>Magnitude of force is its size and</i>
2/9	Blockhead		FORCE: Collision of object with various densities causes them to move at different speeds and directions.	
2/10	Blockhead		FORCE: Various directions and magnitudes of force cause various directions of movement.	

### 3.4.1. WORLD 2 LEVEL 1



Level 1 continues building upon the concept of selecting the correct amount of force but adds the concept of directionality applied to a moving object.

### 3.4.2. WORLD 2 LEVEL 2



Level 2 continues with force and direction but add the previous concept of a rubber ball to reach higher levels.

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#### 3.4.3. WORLD 2 LEVEL 3



Level 3 adds new concepts in the way force is applied and the concept that size and mass are associated with forces. The player must select the correct size ball to put into the launcher in order to knock (collision) the metal ball into the target.

---

#### 3.4.4. WORLD 2 LEVEL 4



Level 4 requires the player to select the correct ball, impact force and place them both in the correct location for the spring launch and impact to knock the first ball into the metal ball so it can hit the target. Multiple collision concepts are introduced.

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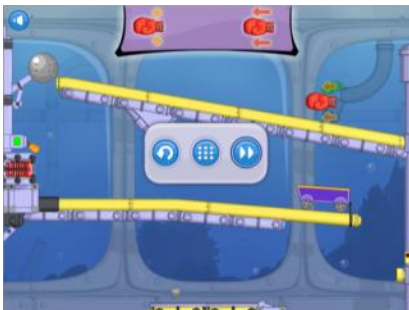
#### 3.4.5. WORLD 2 LEVEL 5



In level 5 the player must select the correct mass object to place in the path so the rolling ball will knock the object over and set off the elevator to work the ball up the levels to the top to reach the target.

---

#### 3.4.6. WORLD 2 LEVEL 6



The player selects the correct force in level 6 to make the large metal ball knock the cube over the fall, tripping the switch, rolling the cart down the ramp, dropping the cube onto the pad to be knocked over into the target.



---

#### 3.4.7. WORLD 2 LEVEL 7



In level 7, the player selects the right mass object to cause the “teeter-totter” effect and launch the cube to the target.

---

#### 3.4.8. WORLD 2 LEVEL 8



Level 8 required the player to select the correct location for the pulse to propel the rubber ball between the gloves into the target guide.

---

#### 3.4.9. WORLD 2 LEVEL 9



Level 9 is another force amount and location selection to launch the rubber ball into the structure so the cube will fall onto the target. Not surprisingly, this concept is easily grasped by the “Angry Birds” players.

---

#### 3.4.10. WORLD 2 LEVEL 10



Level 10 requires correct placement of 2 conveyer belts to complete the path from the top, triggering the switches (which turn on the Ferris Wheels) and move the cube through to reach the target.

### 3.5. WORLD 3



This world opens with a story sequence of the polluted forest world called Arbus. The imagery is shown with the SEL concepts in Section 4.2 There are eleven levels in this world building on the previous concepts and adding other variations of force and trajectory. Again, the user has the ability to select the next level or any unlocked level. The following matrix ties the Teaching focus / Instructional goals to the game level.

World / Level	Character (green if intro)	Props	Teaching focus	Instructional Goals /Background Knowledge
3/1	Robo		GRA VITY: vary speed of falling object by changing slope steepness	Students can describe gravity as behaving as a downward-facing force. Students can predict and recognize that as the surface slope increases, the magnitude of the component of the gravitational force acting along the surface in the downward direction increases. BACKGROUND: <i>Motion is the act of changing position. Objects with greater mass have a</i>
3/2	Robo		GRA VITY: vary speed of falling object causes diff speeds on the ground	
3/3	Robo		GRA VITY: dif slope steepness causes more momentum	
3/4	Robo		GRA VITY: Adjusting slope on a falling object varies speed.	
3/5	Blockhead		GRA VITY: Varying object mass or fall distance also varies force of a falling object.	
3/6	Robo		GRA VITY: Predict path of a launched object to land in a certain place.	Students can recognize that when an object is projected into the air, the force due to gravity acts downward on the object. Students should be able to predict where the object will land. BACKGROUND:
3/7	Blockhead		GRA VITY: given diff trajectories, gravity and momentum cause diff landing spots	
3/8	Blockhead		GRA VITY: objects of diff mass fall at same rate	
3/9	Robo		GRA VITY: predict landing of objects w gravity	
3/10	Robo		GRA VITY: predict landing of objects w gravity	
3/11	Robo		GRA VITY: predict landing of objects w gravity	

#### 3.5.1. WORLD 3 LEVEL 1



Level 1 goes back to the gravity based force with the added concept of the force required to get over the hill to make the target by way of the elevator.

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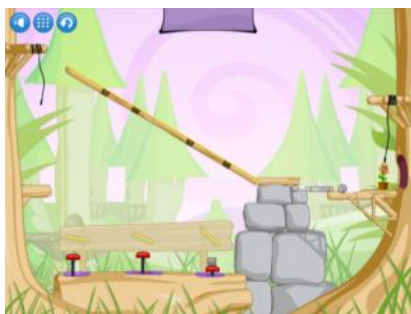
### 3.5.2. WORLD 3 LEVEL 2



This level 2 is very complicated. The player must correctly place three ramps to guide the ball down to the target. New concepts here involve arresting motion.

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### 3.5.3. WORLD 3 LEVEL 3



Level 3 requires the player to place the cube over the correct plunger to raise the ram and send the ball rolling down into the metal bar, knocking it over the gap and continuing on to reach the target.

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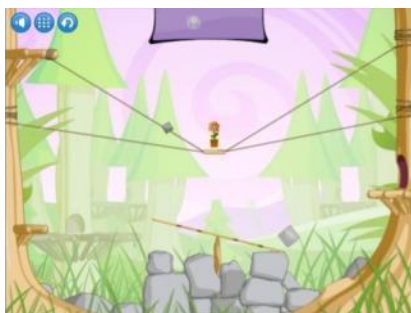
### 3.5.4. WORLD 3 LEVEL 4



In level 4, the player must correctly choose 2 ramps and place them so the ball rolls across the path, tripping the switch and then returns with the correct amount of momentum to fall into the gap (opened by the switch) and land on the target.

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### 3.5.5. WORLD 3 LEVEL 5



Level 5 brings back the leverage concept. The player must select the proper mass and position it at the correct location to launch the cube up to reach the target.

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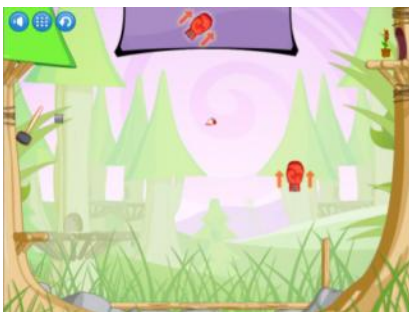
### 3.5.6. WORLD 3 LEVEL 6



This level, 6, has the player place the force and ramp in the correct locations to knock the falling ball across the gap, onto the ramp so it rolls back down to reach the target.

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### 3.5.7. WORLD 3 LEVEL 7



Level 7 adds a swinging hammer along with the impulse force to knock the falling ball across the gap and then pop it up to the top to reach the target.

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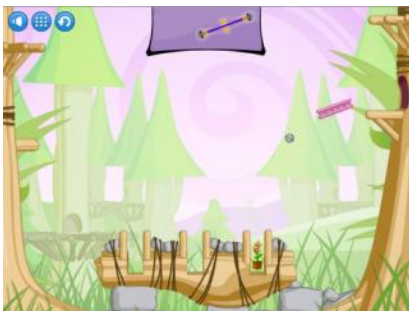
### 3.5.8. WORLD 3 LEVEL 8



Level 8 begins with the cube and the rubber ball suspended in place. The player must select the correct force and place it as well as recognize that the rubber ball must not hit the switch. The ramp must be placed to block the rubber balls decent. This is the first time the player has been required to “Prevent” an action.

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### 3.5.9. WORLD 3 LEVEL 9



In level 9, the player begins a series of 3 almost identical levels. All of the components are the same in all levels. In this level, the target is closest to the path of the falling ball, so the ramp is all that is required to redirect the ball into the target area.

### 3.5.10. WORLD 3 LEVEL 10



Level 10 has the target further out forcing the player to select a spring bar to propel the ball further and then to select the correct location for this type of force.

### 3.5.11. WORLD 3 LEVEL 11



The player completes the game in level 11 by selecting the spring bar again and placing it in the correct location. By following the progression of these three, the number of failures on this level would be a string indication of the skills learned, and the ability to apply them to differing situations.

## 3.6. GAME CONCLUSION

At the conclusion of the game, the player is congratulated and presented with a screen of their achievements. These achievements, as well as all of the game metrics are recorded by the Web Server.



## 4. OUR SOCIAL EMOTIONAL LEARNING APPROACH

The power of video games to remove the individual persona and create the compulsion to engage with a digital system may be powerful allies in addressing Social Emotional Learning. CRESST/UCLA is developing the storybook to accompany the OurSpace game that will expand the SEL storyline under educator-lead guidance appropriate to the educational and emotional maturity of the students.



#### 4.1. SOCIAL EMOTIONAL LEARNING CONTENT TO BE INCLUDED IN PHASE I PROTOTYPE

NOTE: This list is based on the assumption that game will eventually include some opportunities for children to engage in these activities within game play, with the understanding that phase 1 prototype will focus on opportunities for children to observe (at least some) of these behaviors. For example, observing different emotions via the belts and seeing another avatar respond appropriately. Additionally, it is not implied that these two concepts are sequential to each other (i.e., address self-awareness before empathy); that is, both of these strands could potentially be woven into the game concurrently.

Concept	Early	Mid	Advanced	Example Learning Objective
Self-awareness /personal safety	Identify when feeling threatened or uncomfortable (i.e., when being aggressed upon, physical or emotional bullying). Seek help from adult when experiencing threat.	Incorporate appropriate responses to aggressor into bullying response, in addition to seeking help (e.g., “no” statement, telling them to stay out of personal space “bubble”).	Identify when problem situation is occurring with others in environment (e.g., peer is being bullied). Respond appropriately to conflict (most basic – seek outside/adult help). Make appropriate attributions of cause for conflict (i.e., not blaming victim, whether self or other).	Child presented with new scenarios (outside of game narrative) where potential problem situation (other character being aggressed on) occurs, uses appropriate responses (“no” statements, seeks outside help). Student makes appropriate attributions for victim being in that situation (external, accidental).
Empathy/ perspective taking	Acknowledge that others in the environment may experience a situation differently/ experience different emotional responses from you (e.g., I am happy when I win, loser experiences situation differently). Basic identification of others feelings and perspectives using simple cues (e.g., active listening to what the other person is saying).	Use more advanced cues (including non-verbal, contextual) to identify other’s perspectives, emotional responses (e.g., someone’s facial expression, how they are behaving).	Respond in appropriate, pro-social way to others based on these cues (note: the range of situations/activities this could apply to is of course broad – for the purposes of this game we have initially identified the need for help as the target – i.e., using cues to identify when another is struggling/might need help with learning or accomplishing something within the game, and either providing or obtaining help for that other person). Make preliminary, positive causal attributions for help seeking (e.g., changeable, controllable).	When presented with a new set of stimulus outside of game play (i.e., new avatars, photos) child is able to accurately identify feelings/emotions given cues (ranging from simple to more advanced). When presented with a new scenario (outside of game play), child is able to identify cues for other needing help/assistance. Child responds appropriately to others need for help in this scenario (i.e., provides it, seeks assistance). Child makes positive attributions for why others need help in this scenario (i.e., need more information/resources as opposed to an internal cause).

CRESST/UCLA is developing the storybook to accompany the OurSpace game. This storybook will support the development of these concepts

## 4.2. IN-GAME CONCEPTS

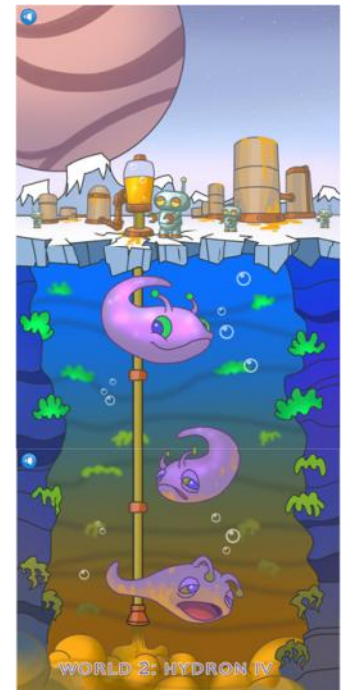
The prototype game implements two SEL concepts within the game in the concept of Empathy/Perspective Taking. The first concept is the nature of the worlds being



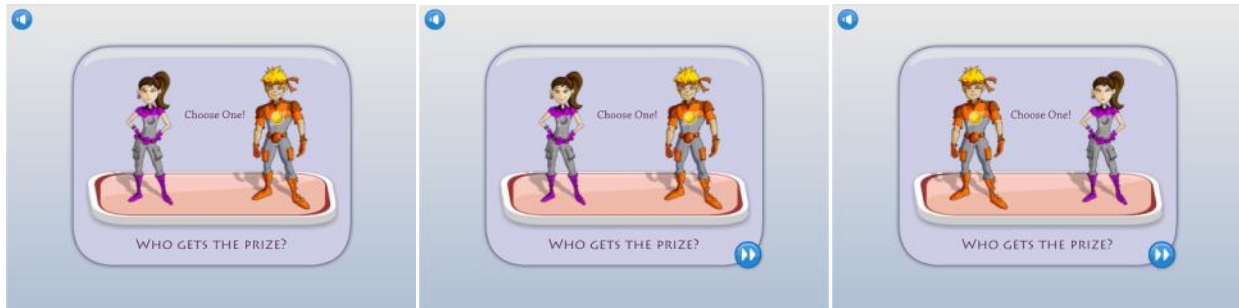
visited by our traveling team. The opening theme of the game is a panning image of a polluted world being improved and our travelers beginning their travels to help other worlds.



The opening theme of each subsequent world opens in a panning image of a pristine world being damaged through pollution or other environmental damage. Our heroes try to solve problems to improve the situation. The first world is an air world in which all the game play takes place in the sky. The second is the world of water, and the third is a forest- based world. Scenes from the world opening are shown in the surrounding pictures.



The second Empathy/Perspective Taking takes place at the end of certain levels within each game where the player is asked to award the prize to one of 2 heroes. One is sad and the other is happy (left image below). The player who selects the sad hero is rewarded with both heroes smiling (center image below). If the player selects the happy player to get the award, both heroes are sad before going to the next level.

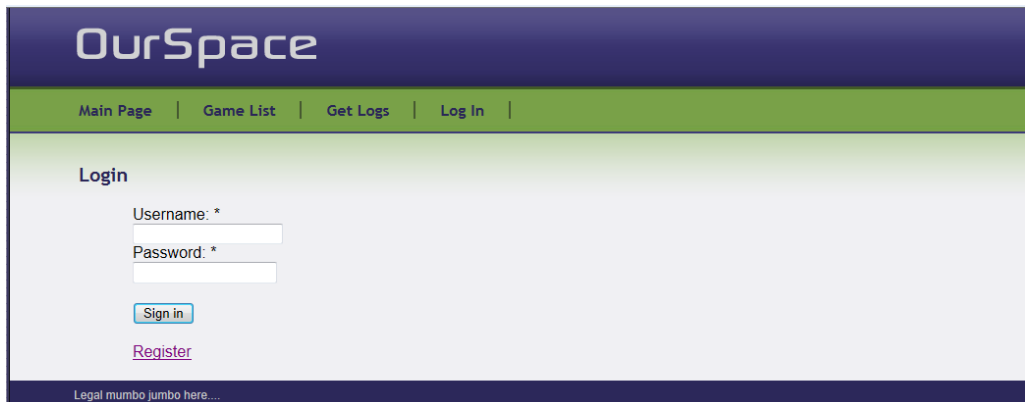


### Preliminary Test Results

During game play, not formal testing, student feedback from UCLA was received on a number of items. This game play took place without the benefit of the entire story line and educational program. One individual noted the pollution and identified with those objectives. When asked why they gave the award to a particular hero, one student noted “Because they were sad”. These are promising results identifying key points without the instructional program.

## 5. OUR GAME ENVIRONMENT

The server for access is <http://engagedemo.intific.com/> with the login credentials identified above. The environment screens follow, but minimal effort has been applied to these while the primary focus was maintained on the Prototype Game.



The user may register at this location and create an account for their use. Once the user has logged in the initial attempt to play the game will require two additional credentials. DARPA has been provided with the game credentials.



The screen below is where the user creates their individual account. This is recommended to ensure that additional monitoring/observing does not adversely affect test subject scores.

The screenshot shows the 'Register' page of the OurSpace website. The header is dark blue with the 'OurSpace' logo in white. Below the header is a green navigation bar with links: 'Main Page', 'Game List', 'Get Logs', and 'Log In'. The main content area is light green and contains the registration form. The form includes fields for 'Username: \*', 'Password: \*', and 'Confirm Password: \*'. There is a checkbox for 'Check if user is an editor' and a CAPTCHA section with the text 'Please verify you're a human' and a distorted image of the word 'mumbo'. A 'Register' button is at the bottom of the form. The footer is dark blue with the text 'Legal mumbo jumbo here....'.

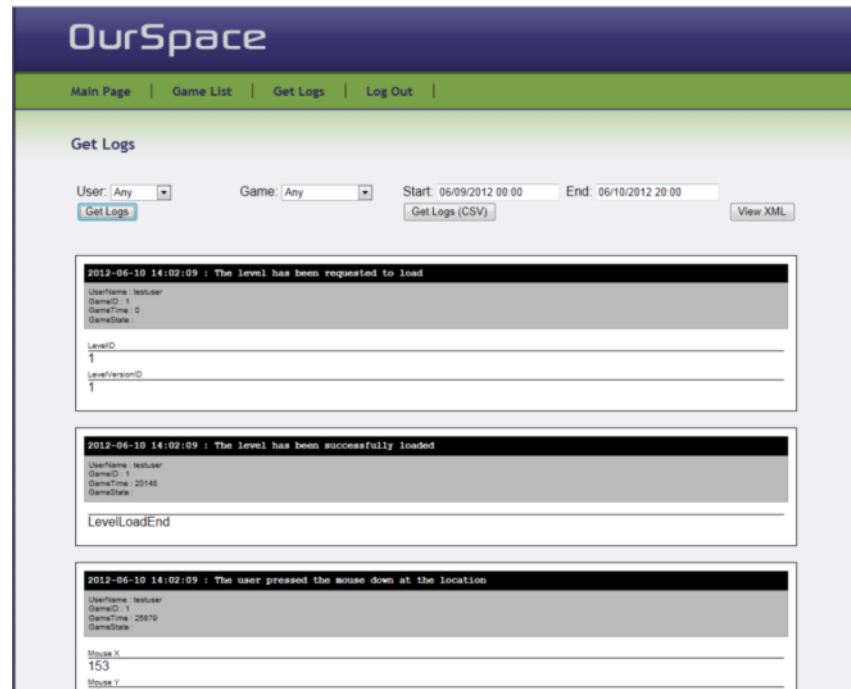
The Game page below allows the user to access (play or edit) the game. Access control by individual is not currently in place.

The screenshot shows the 'Game List' page of the OurSpace website. The header is dark blue with the 'OurSpace' logo in white. Below the header is a green navigation bar with links: 'Main Page', 'Game List', 'Get Logs', and 'Log Out'. The main content area is light green and contains the 'Game List' section. It features a table with one row for 'Flash Roboball' and two buttons, 'PLAY' and 'EDIT', next to it. The footer is dark blue with the text 'Legal mumbo jumbo here....'.

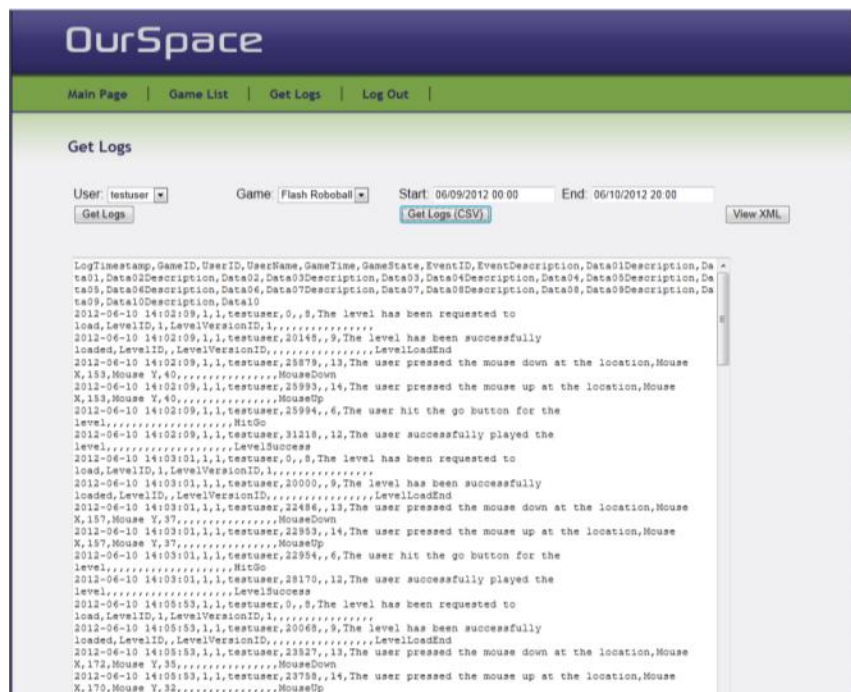
The Get Logs option allows the user to retrieve individual or all logs in multiple formats.

The screenshot shows the 'Get Logs' page of the OurSpace website. The header is dark blue with the 'OurSpace' logo in white. Below the header is a green navigation bar with links: 'Main Page', 'Game List', 'Get Logs', and 'Log Out'. The main content area is light green and contains the 'Get Logs' section. It includes dropdown menus for 'User: Any' and 'Game: Any', and input fields for 'Start:' and 'End:'. There are three buttons: 'Get Logs', 'Get Logs (CSV)', and 'View XML'. The footer is dark blue with the text 'Legal mumbo jumbo here....'.

Selecting the Get Logs yields



Get Logs (CSV) allows the user to retrieve the data in a CSV format



The server for OurSpace is based on a number of commercial products (Linux, Apache, MySQL, PHP: LAMP Stack) and is targeted to run in any HTML Browser that supports Flash. The prototype application is Flash. In order to provide the desirable level of cross platform compatibility and the ability for multiple points of game edit/creation (Educator, Developer, and Administrator), we began development of a game engine hosted in HTML 5. At this point the fundamentals of the HTML 5 game engine are in place and the first 8 levels of the Prototype Game have been ported into this engine. Levels 1, 2 and 4 have been completed with associated graphics.

## 6. RECOMMENDATIONS

Through this deliberate fusion of the most rewarding aspects of game creation and play, with educational objectives and instructor lead learning, we have developed a method and tool base which can be expanded to address multiple types and levels of interactive learning.

The Prototype Game is being tested by CRESST/UCLA, including the statistical information being collected. We anticipate their report by the end of the summer in order to incorporate the recommended changes into the Test-Ready game.

We have been awarded Phase II and work is progressing, expanding the capabilities with the goal of interim deliverables and a test-ready game software in 6 months and Final Game software 23 months after award of Phase II. The incremental funding allocated in the initial transaction is sufficient to continue work through portions of October. Additional resources are needed during the early months of Phase 2 to accomplish the engineering, game design and art requirements needed to meet the test-ready game deliverable. Intific recommends release of additional funding, to ensure continuity of effort.

## 7. CONTRACT COSTS

REPORT DATE: 06/08/12 11:40	INTIFIC, Inc.	0001
PERIOD ENDING: 05/31/12		
	PROJECT MGR:	Michael Richard
JOB SUMMARY REPORT	DIVISION #:	1
CLIENT: ONR	EST TOT VAL:	3,936,951.00
PRIME CONTRACT ID: N00014-11-C-0593	FUNDED VALUE:	2,069,726.00
CONTRACT NUMBER: 1037-001	JOB TYPE:	CPFF
	TOTAL CONTRACT INCURRED	
Direct Labor	423,858.00	
TOTAL LABOR COST	423,858.00	
Subcontractor	411,454.00	
Direct Travel	15,166.00	
Other ODC's	2,583.00	
TOTAL OTHER DIR.COST	429,203.00	
TOTAL INDIRECT EXP.	626,089.00	
TOTAL CONTRACT COSTS	1,479,150.00	
FEE COMPUTED 7.00	103,544.00	
CONTRACT REVENUE	1,582,694.00	

## 8. KEY PERSONNEL

The Intific production staff has designed and developed several hundred commercial games for all ages and has also developed a number of software products for demanding government customers. All of these validate the ability of Intific to design, produce and deploy complex software architectures in diverse and demanding environments. The team that Intific has assembled for this effort represents experienced senior members of our design team that have mature, established skills from years of experience in the technology, DoD and commercial gaming communities. Intific has supplemented its internal team with senior advisors and institutional organizations who have the extensive knowledge sets and required for program success. Intific will serve as the system integrator for the effort, establishing consulting and cooperative agreements with key personnel and companies.

The Intific Team is led by Dr. Amy Kruse and Michael Becker who will oversee a software development organization of best-of-breed professionals as they work in close coordination with top experts in their fields. Intific's design, management and engineering expertise across three nation-wide facilities will bring this program to life, continuously consulting and evolving our systems. Intific has on staff dozens of game industry veterans with many hundreds of man-years of design and development expertise in creating world-class products for all major publishers, resulting in well over a billion dollars of revenue. Our employees worked on such titles as *The Lord of the Rings*, *The Sims*, *America's Army*, *Myst*, *Spore*, *Silent Hunter*, *Wing Commander*, *Panzer Command*, and many others. The following staff members and consultants played key roles in development of Phase I and will continue their contributions for Phases II and beyond.

### 8.1. DR. AMY KRUSE, INTIFIC PRINCIPAL INVESTIGATOR

Dr. Amy Kruse joined Intific, Inc. in January 2010, as Executive Director forming a new Neuroscience Division. She now directs active Intific programs with Department of Homeland Security (*Micro-Expression Simulator*), DARPA (*IDD-3D*, *NeuroNav*, and *NowTu*), and the intelligence community. Dr. Kruse has over nine years of experience developing novel neuroscience-based programs and technologies for the Department of Defense. From January 2005 to January 2010, Dr. Kruse served as a government civilian Program Manager in the Defense Sciences Office at the Defense Advanced Research Projects Agency (DARPA) in Arlington, VA.

Dr. Kruse is currently overseeing a joint DARPA/TATRC *Stress-Sim* effort, along with development of *HAPE Sim* jointly for the USMC/DARPA. During her tenure at DARPA, Dr. Kruse managed over nine programs including efforts in Augmented Cognition, Neurotechnology for Intelligence Analysts, Accelerated Learning, and Cognitive Technology Threat Warning Systems among others. Prior to DARPA, Dr. Kruse served as a technology and program management consultant at Strategic Analysis Inc. in Arlington, VA. During her time with SAINC, she provided hands-on technical assistance to nascent neuroscience programs at DARPA, ONR, and the Naval Research labs. She has been actively involved in neuroscience research for over 15 years. Dr. Kruse earned her B.S. in Cell and Structural Biology (1995) and her Ph.D. in Neuroscience (2001) from the University of Illinois at Champaign-Urbana where she was awarded a National Science Foundation Graduate Fellowship in Neuroscience.

## 8.2. MICHAEL BECKER, INTIFIC CREATIVE DIRECTOR

Michael Becker wrote and illustrated comic books, invented educational *Eco-Comics* early in his career, and was an illustrator for Dick Clark Productions and *The Smothers Brothers Show*. Michael also has over 30 years of acclaimed experience in electronic entertainment, having designed, written, art directed and developed hundreds of games, products and processes throughout the video game and multimedia industries, including Bantam Book's first *Choose Your Own Adventure* games, Apple Computer's first multimedia, the first interactive movies and the very first online games. He was Electronic Arts' first Creative Director and served as senior designer and writer for EA's *The Lord of the Rings* product line, writing and directing all the film talent and creating original LOTR franchise offerings while generating over a half-billion dollars in revenue. In over 14 years at Electronic Arts, Mr. Becker creatively spearheaded numerous advancements including the overall design of EA's *John Madden Football* franchise on multiple platforms, EA's first CD and online development efforts, digital and animation processes and 3D pipelines for game rendering, real-time digitizing and compositing and real-time content publishing. He developed EA's audio and localization procedures and created the ongoing live-broadcast motif for EA Sports. Michael also drove acclaimed Alternative Reality Gaming products and episodic and community content creation for EA's innovative *Majestic* product.

Michael Becker also worked extensively on commercial military simulation games, playing key roles in the creation of high concepts, interfaces, design processes, campaign flow, and cinematic systems for the Jane's and other product lines including *Strike*, *Road Rash*, *World War II Fighters*, *Jane's Online Arena*, *Fleet Command*, and *USAF* and has worked with major game publishers in creating other key franchises including Sony (*Uncharted*), THQ (*WWE*) and *Game of Thrones*. With Flint Dille, Michael reinvented EA's first million-selling videogame franchise with *Soviet Strike* and *Nuclear Strike*. Mr. Becker has done creative work on every major console and computer system for almost every major company. Michael now serves as Director of Design for Intific and is involved in State Department, DARPA, DHS, DoE, USMC, NRL, ONR, USAF and U.S. Army projects, developing suspicious behavior detection training, next-generation artificial intelligence, avatar control, virtual puckstering, socio-cultural training, strategic wargame visualization, PTSD and HAPE modeling, HCI hypothesis generation, mobile phone training tools and innovative learning programs, judges WGA videogame scripts, and holds two patents.

## 9. FACILITIES AND EQUIPMENT

Intific, Inc. is headquartered in Hampton, VA, with design and development studios in Austin, TX, a financial office in Peckville, PA, as well as a business development office in Alexandria, VA. Collectively, approximately 30,000 square feet of office space are used for corporate management and software development. Most of the Intific facilities possess Facility Clearances at the Top Secret level with Secret level safeguarding clearance from the Department of Defense in the Austin facility. The Austin facility also operates an authorized information systems at the Secret level. These spaces meet all local, state, and federal environmental and other building code regulations. Intific does not do any industrial manufacturing. Many senior company officials, system, and software designers hold up to Top Secret/SCI clearances.